



NTSB National Transportation Safety Board

Office of Aviation Safety

Aircraft Icing Accidents

Donald Eick – NTSB Senior Meteorologist

Presentation to NCAR In-flight Icing Users Technical
Interchange Meeting (TIM)

Washington, DC

February 2015



2 feet of snow

NTSB



CEN09MA142
Empire Airlines
Lubbock, TX
January 27, 2009



NTSB Accident Investigations

Man-Machine-Environment

**KLBB 271053Z 02011G18KT 2SM -FZDZ BR OVC005 M08/M09 A3013 RMK AO2
CIG 004V009 SLP228 P0000 T10781094=**

NTSB Accident Investigations

- Most common cause of fatal accidents is due to loss of control (LOC) in instrument meteorological conditions (IMC)
 - Aircraft is often heavily fragmented and/or fire damage
 - Physical evidence – lacking
- How do we know it was an icing related event?
 - Physical evidence of airframe icing
 - Pilot reported encountering conditions to ATC
 - Other PIREPs & reports of icing, witness statements
 - Performance analysis (Flight Data Recorders), and other radar data
 - Weather conditions favorable conditions

CEN14FA032 – Castle Rock, CO

Glasair, N535SP

Oct. 28, 2013

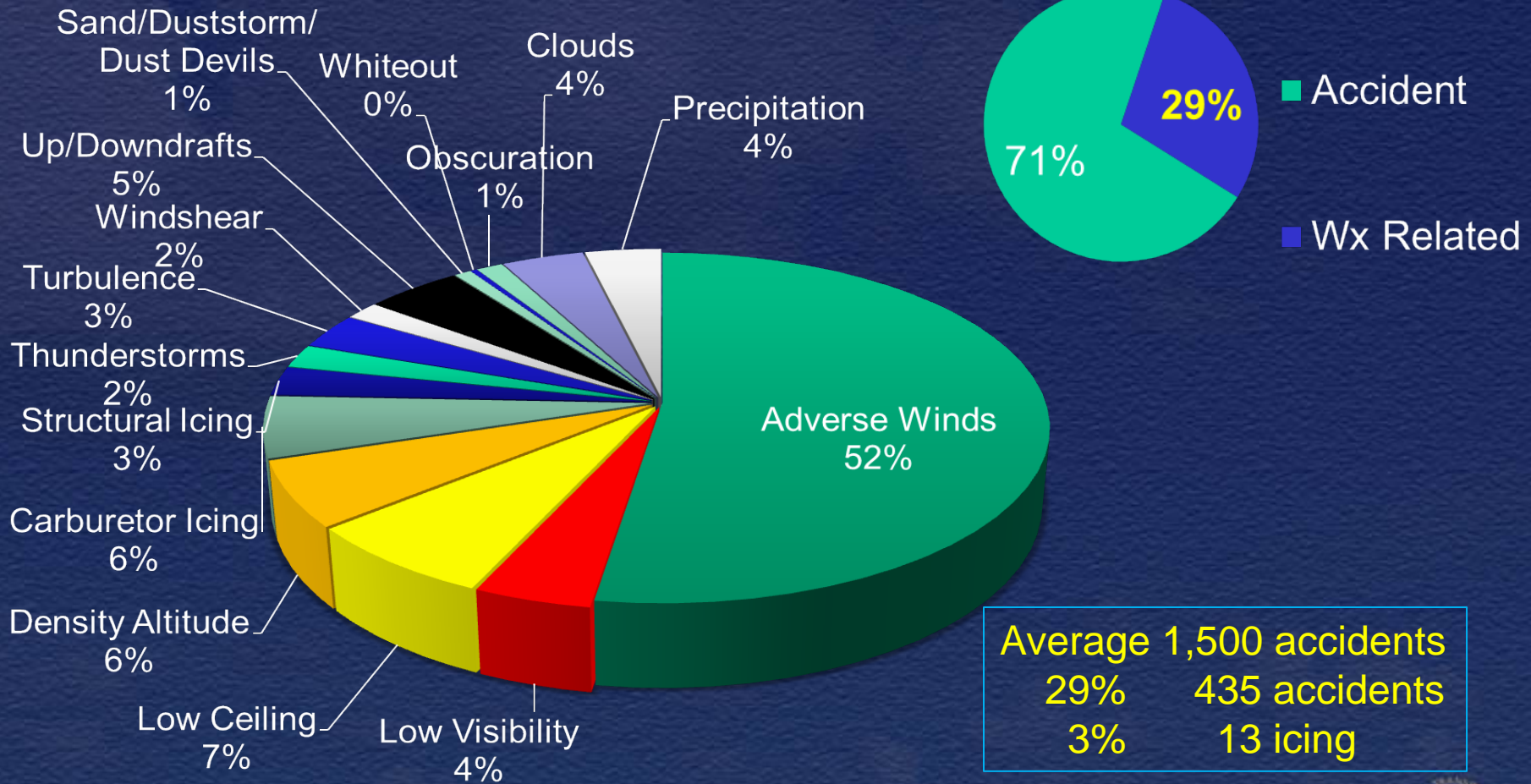
Sometimes you get lucky! Pilot survived, reported icing to ATC, and physical evidence remained.



NTSB Probable Cause: The pilot's improper decision to continue flight into known icing conditions, which adversely affected the airplane's performance and resulted in a loss of airplane control.

Part 91 – Weather As Cause/Factor period 2000-2011

19,441 Accidents




Aircraft Icing Accidents

- **NTSB Query system**
 - limitations some “icing” incidents and events not captured (391)
http://www.nts.gov/_layouts/nts.aviation/index.aspx
- **In-flight icing**
 - Induction system/carburetor icing
 - Loss of control (LOC) - stall
 - Control surfaces impairment
 - Pitot tube icing
 - *new concern: Ice crystal engine power losses
- **Ground icing concerns**
 - Loss of control on takeoff/contaminated surfaces – frost/snow on aircraft
 - Contaminated runways/runway excursions

NTSB 2010 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
Jan. 4, 2010	ERA10LA105	Greenbush, ME	C172, N5118J	1	Continued into icing/turb cond
Jan. 5, 2010	CEN10MA088	Prospect heights, IL	Lear 35, N720RA Part 135	2	LOC stall unkn – icing conditions reported on descent
Jan. 6, 2010	CEN10LA090	Kearney, NE	Beech C99, N206AV Part 135	0	LOC – stall icing, hard landing, substantial
Jan. 18, 2010	CEN10FA097	Elyria, OH	MU-2, N80HH	4	LOC – stall unkn, IMC & icing conditions
Feb. 6, 2010	CEN10FA114	Winslow, AR	Beech A36, N1085D	4	LOC – known icing, IMC SD likely
Feb. 17, 2010	ANC10LA019	Kwigillingok, AK	C208, N207DR Part 135	0 8 minor	LOC – takeoff ,ice on wings, stall, substantial damage
Feb. 18, 2010	CEN10LA126	Albany, OH	C172, N9771B	0	VFR-IMC icing, LOC ¼ mile short
Apr. 27, 2010	ERA10FA246	Bear Branch, KY	Beech 58, N1856S	2	Icing – unable to maintain altitude

Continued... **NTSB** 

NTSB 2010 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
Oct. 25, 2010	WPR11FA032	Lander, WY	Mooney, N201HF	4	Adverse Wx Icing condition
Dec. 15, 2010	CEN11FA110	Edwards, CO	Beech B60, N571M	2	CFIT icing conditions
Dec. 22, 2010	ERA11FA095	Dundee, NY	Mooney, N968SM	1	LOC – icing A/C not approved
Dec. 22, 2010	CEN11FA124	Colorado Springs, CO	Mooney, N79869	2	LOC – icing, A/C not approved
Dec. 24, 2010	ERA11LA099	Syracuse, NY	Beech F35, N3448B	0 1 minor	LOC – stall icing A/C not approved
Dec. 25, 2010	CEN11CA135	Troy, MI	Lancair, N385AS	0 2 minor	LOC – stall landing, roll

14 events – 22 fatalities

NTSB



NTSB 2011 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
Jan. 9, 2011	CEN11FA150	West Cliff, CO	Piper PA46, N727MC	2	LOC – MTN Wave, MOD icing
Jan. 31, 2011	OPS11IA027	Dayton, OH	EMB145 Part 121	0	Departed runway, landing -FZRA
Feb.21, 2011	CEN11CA199	Romeoville, IL	C310, N119RS	0	Hard landing icing, substantial damage
Mar. 7, 2011	ERA11FA182	Allagash, ME	Diamond DA40, C-GPDO	1 1 serious	LOC –stall on landing, 1-2”ice on airframe
Mar. 19, 2011	WPR11FA170	Butte, MT	C310, N4914A	1	LOC – icing, +SN
Mar. 20, 2011	WPR11FA173	Daggett, CA	C210, N50MC	3	LOC - icing
Mar. 24, 2011	ERA11GA207	Ashland, ME	C185, N724MT	1	Snow Squall
May 16, 2011	ANC11TA031	Atqasuk, AK	Beech 200, N7865R, EMS Public Use	0 3 minor	LOC- stall in icing on landing

Continued..

NTSB



NTSB 2011 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
May 18, 2011	WPR11FA230	Pioneer, CA	Lancair N121J	1	LOC – unknown, favorable icing
June 15, 2011	ERA11LA344	Gray, TN	Beech A100, N15L	0	LOC - Convective icing/turb, substantial
Nov. 18, 2011	WPR11FA040	Casper, WY	C337, N357	1	LOC landing in icing conditions
Dec. 2, 2011	CEN12LA095	Midland, TX	Beech F90, N90QL	0 1 serious	LOC landing in icing, roll
Dec. 9, 2011	CEN12CA104	Pampa, TX	C421, N421CE	0	Hard landing icing, substantial
Dec. 20, 2011	ERA12FA115	Morristown, NJ	TBM700, N731CA	5	LOC icing
Dec. 21, 2011	ANC12CA016	Kwigillingok, AK	C207, N6480H Part 135 Cargo	0 1 minor	LOC icing destroyed

15 icing events – 15 fatalities

NTSB



NTSB 2012 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
Jan. 15, 2012	ERA12LA145	Brewster, MA	Piper PA24, N7648P	2	LOC - unknown, icing existed
Mar. 5, 2012	ANC12IA024	Anchorage, AK	Lear 35, N544LM Part 135 EMS	0	SVR Icing on final, overrun
Feb. 2, 2012	CEN12FA151	Pueblo, CO	Lear 35, N31WS	0	Runway excursion contaminated/cross wind, substantial
Feb. 19, 2012	CEN12FA161	Hayden, CO	C414, N4722A	2 4 serious	LOC stalled on approach, landed short
Oct. 5, 2012	CEN13CA005	Peyton, CO	Piper PA24, N6661P	0	SVR icing LOC, stalled on final, substantial damage
Dec. 10, 2012	CEN13FA096	Compton, IL	HEMS MBB BK117, N911BK	3	Inadvertent encounter with wx SN/FZRA
Dec. 14, 2012	CEN13FA105	Amarillo, TX	Beech E90, N67PS	2	LOC, in-flight breakup
Dec. 18, 2012	WPR13FA072	Payson, AZ	Piper PA31, N62959 Part 135	1	LGT-MDT icing reported

8 icing events – 10 fatalities

NTSB 2013 Icing Accidents

Date	NTSB	Location	Aircraft	Fatal	Remarks
Jan. 2, 2013	CEN13FA122	Clear Lake, IA	HEMS Bell 407, N445MT	3	LOC - icing
Jan. 11, 2013	CEN13FA130	Maxwell, NE	Beech BE58, N36VE	4	LOC - icing
Mar. 15, 2013	CEN13LA201	Winsted, MN	PA23, N18JP	0 (7 uninjured)	Loss of power in icing, forced landing substantial
Oct. 18, 2013	CEN14FA009	Derby, KS	C500, N610ED	2	LOC - icing
Oct. 28, 2013	CEN14FA032	Castle Rock, CO	Glasair N535SP	1 serious	LOC – icing, substantial
Nov. 29, 2013	ANC14MA008	St Marys, AK	C208, N12373 Part 135	4 6 serious	LOC approach
Dec. 1, 2013	WPR14FA094	Yellow Pine, ID	Beech B36, N36ML	5	Unable to maintain altitude icing, loss of power
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> 7 icing events – 18 fatalities </div>					

NTSB 2014 Icing Accidents

Note – Probable Causes not issued for most of the 2014 events

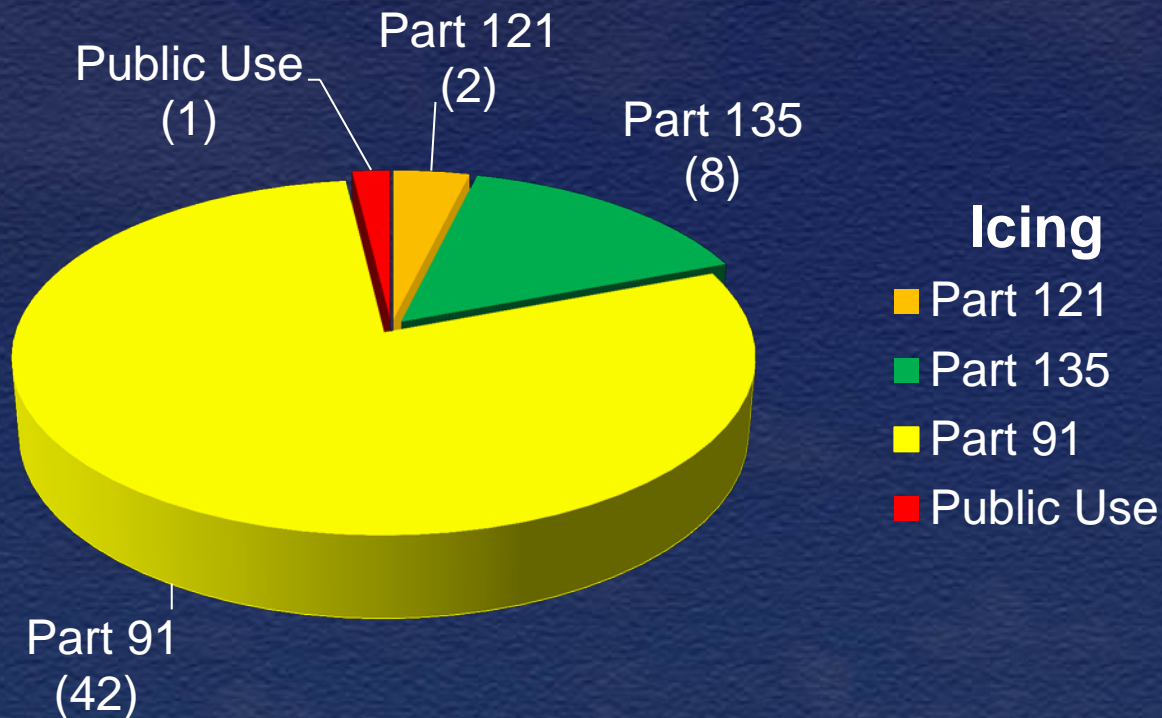
Date	NTSB	Location	Aircraft	Fatal	Remarks
Feb. 3, 2014	ERA14FA112	Bellevue, TN	Gulfstream 690C, N840V	4	Approach icing conditions
Feb. 5, 2014	DCA14FA058	Memphis, TN	EMB145 Part 121	0	Wing stall, hit runway on landing, icing
Feb. 14, 2014	CEN14IA139	Gunnison, CO	Cirrus SR22, N18DN	0	Icing unable to maintain altitude – pull chute
Oct. 4, 2014	CEN15LA021	Dixon, IL	Raytheon 58, N345PG	0	LOC – uncontrolled descent, icing, substantial damage
Nov. 6, 2014	CEN15FA040	Grover Hill, OH	Cirrus SR22, N811CD	3	LOC - icing
Nov. 12, 2014	CEN15FA044	Clines Corner, NM	Mooney, N231JF	1	LOC – wx favorable icing
Dec. 8, 2014	DCA15MA029	Gaithersburg, MD	EMB-500, N100EQ	6	LOC – stall, icing conditions
Dec. 30, 2014	CEN15LA091	Roswell, NM	C208, N950FE Part 135	0	LOC in icing, landing impacted terrain short of runway

8 icing events – 14 fatalities



Accident Summary

- Period the 5 year period from 2010 to 2014
 - In-flight icing accidents 52
 - Total fatalities 78





Questions?

eickd@ntsb.gov

202-314-6384